

# MEDLARS and the Library Community

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## ABSTRACT

The intention of the National Library of Medicine is to share with other libraries the products and the capabilities developed by the MEDLARS system. MEDLARS will provide bibliographic services of use to other libraries from the central system. The decentralization of the central system to permit libraries with access to computers to establish local machine retrieval systems is also indicated. The implications of such decentralization for the American medical library network and its effect on library evolution are suggested, as are the implications for international development of mechanized storage and retrieval systems.

**M**EDLARS is a computer-based information retrieval system married to a large research library. This intimate association of a computer and a library is, so far as I know, unique in the world. It is this which gives the MEDLARS project special significance for the future of research libraries.

MEDLARS is a child of the scientific revolution. It might have come into being in any of the advanced countries. That it is an American development testifies only to the intensity of this scientific revolution in the United States; both the climate and the times have been propitious.

To understand why the American society has considered desirable an investment in a \$3 million computer-based information system, it would be well to summarize briefly some postwar trends in biomedical research in the United States.

In 1940 medical research in the United States was funded primarily by private foundations. After World War II there occurred a phenomenal increase in government support of research. Today it is estimated the government will spend \$973 million, American industry another \$390 million and private sources \$187 million, for a total of \$1,550,000,000 annually—thirty-seven times as much as the country spent twenty-three years ago.

The growth in volume—of support dollars, of research projects, of research workers, and, of course, of publications—is not unique in the world. Other countries have experienced similar escalation, perhaps not so steep, but nonetheless sharp.

At the same time, new generations of American researchers have learned

of the existence and significance of research conducted in other countries and published in languages other than English, a publication quotient which is also increasing sharply in volume.

This circumstance—new and increasing generations of research manpower, requiring and producing more publications—gives general credence to the belief that the world is experiencing a “publication explosion.” It is further alleged that this condition may have dire consequences for the future of scientific investigation. As Vannevar Bush has warned, “Science may become bogged down in its own products, inhibited like a colony of bacteria by its own exudations.”

But volume increase is not the only problem, nor the only face of the scientific revolution. Medical bibliography has a long record of mastering increases in the number of publications. Less well understood is the interdisciplinary revolution in the sciences, a process which is being accelerated in all countries. The structure of science itself is dissolving before our eyes, becoming fluid, and is in process of recrystallization. Molecular biology, for example, is being assembled from a dozen disciplines, bioengineering from as many more.

From the scientist's point of view, this means that the traditional institutions he has counted on to help him organize his information—journals, abstract services, even libraries—are failing him. Instead of one or two sources for his information, he must now consult fifteen, and still not find all he is looking for. This has led to frustration, to irritation with the older established forms which have traditionally organized scientific knowledge by disciplines, and to an almost frantic effort to invent new forms, new institutions, new devices which he thinks may solve the problem for him.

He appears to need, in short, a super switching mechanism, some type of system which can divert information, no matter in what established field of science it may be generated, or in what language, to the particular configuration of disciplines which represents (for the moment) his research area.

These, then, are the two dynamisms inherent in the scientific revolution which is proceeding with such rapidity in the United States. They are also the dynamisms behind the large volume of research and development going into information retrieval. The successful implementation of a system or systems which can accommodate the vast volumes of information being generated, and at the same time switch freely from use to use any unit of that information, appears to be an absolute requirement of American science.

Almost without exception, the search for such a system has been outside the conventional library. The developments have been conceived by scien-

tists and engineers, not librarians. They have been designed to accommodate new types of published information—the technical report literature of space technology, for example—highly important, but limited in its volume and in its readership. These conditions, and the general state of the art, have been conducive to a great variety of experimentation and testing. The economic incentives are high, the field new, and the opportunities for the development of competitive systems fertile.

It is at this moment that the MEDLARS system becomes operational in the National Library of Medicine. The association of a computer-based information retrieval system with the library function distinguishes MEDLARS from many other developments.

MEDLARS has unique qualifications which give it a significance not shared by any other computer-based information system.

First, it is founded on an understanding of indexing technology derived from eighty years of bibliographic experience with the literature. The problems inherent in the subject control of a scientific literature are new to many scientists and engineers; they are old to the Library. This has given MEDLARS a tremendous advantage.

Second, MEDLARS will handle a larger volume of *published* literature than any existing system, and service it on behalf of a very large scientific public. The 250,000 citations to be handled annually by MEDLARS in five years represent a large proportion of the total scientific literature.

Third, it is not a "closed" system, in the sense of serving the interests of a single industrial firm, or a single government agency. It is an "open" system, located in a national agency with very broad responsibilities to the medical and related professions of the United States.

Fourth, MEDLARS comes at a time when computer technology and the availability of computers in medical research institutions throughout the United States will permit the multiplication of its search potential by the duplication of searchable tapes.

Fifth, MEDLARS has been developed in a library situation, where the power of supplying the textual information from the published literature matches the power of retrieving citations. It is this last which gives MEDLARS its particular strength, and its significance to library development generally. And it is this particular combination of powers which the NLM hopes to build on in the further development of the MEDLARS system.

The NLM intends to make this new electronic retrieval power available generally to other medical libraries over the next five years. In doing so, it is thinking of a three-stage development program.

During the first stage, which will begin in January 1964 and last for approximately a year to a year and a half, the NLM will be preoccupied with

its own operational problems. It is hoped that the first issue of the *Index Medicus* to be organized by the computer and composed by the graphic arts printer will appear by January 1964. The scheduling of successive issues and the elimination of errors will be priority responsibilities, and staff time available for experimental production of other services will be contingent on the operational success of the computerized *Index Medicus*.

During this first stage, however, the Library counts on the production of a limited number of recurring bibliographies, and these are currently being negotiated and planned with research groups. The purpose of such recurring bibliographies is to provide workers in a field of research with periodic listings, organized under selected MeSH headings, and representing new publications of concern to the research area. Each of these will constitute a current-awareness service which will be duplicated and distributed to a large number of scientists.

The Library will also experiment with the handling of demand searches during this first stage. Since the references stored on magnetic tape start with 1963, the first few years of MEDLARS will provide but a limited store for searching. With a five-year accumulation of references, such demand searches will begin to be productive.

The implications of this first stage for other libraries will be limited. We anticipate that the recurring bibliographies will stimulate more requests for loans and photoduplications throughout the country, but we shall not be in a position to offer machine search services widely because of our preoccupation with learning to understand the system, and making it operate efficiently.

A second stage contemplates preliminary steps toward the decentralization of the MEDLARS search potential. By mid-1965 we shall presumably have made some resolution of the problems inherent in the programming of demand searches, and shall be in a better position to pass our operational experience on to other would-be users. There will remain, however, many questions relating to the costs, types of service, and operational problems of decentralized search centers, and we believe it necessary to acquire cost data before MEDLARS is widely decentralized. Furthermore, the technical experience which we have gained must be passed on to others before we can successfully program searches from MEDLARS tapes. Finally, there remain a number of technical problems related to the duplication of magnetic tapes, the conversion of tapes, and the forms acceptable to other common types of computer, and above all, a major reprogramming effort so that other computers can search the converted tapes.

Stage two, therefore, will be concerned with the preliminary testing, training, and conversion necessary to the use of MEDLARS tapes outside the National Library of Medicine. The Library intends to establish two

cooperative demonstrations in other institutions for the purpose of collecting cost data and gathering operational experience in the field. It intends also to establish training facilities related to these centers, so that the manpower essential for later decentralization may be adequately trained; and finally, it intends to contract for the necessary reprogramming, a sizeable undertaking which may take as long as a year.

During this second stage, the Library will be increasing the number of recurring bibliographies and demand searches, and these will start to have an impact on the volume and the character of library services required by research scientists throughout the country. We can expect that medical libraries will be subjected to a considerable increase in volume of requests, and that many of these requests will be for literature not commonly available. This is certain to create added stress unless local resources are strengthened to carry the added load.

The third stage will presumably occur sometime in 1966. We all hope that by that time the operational problems of the system will have been resolved, and the field testing, training, and conversion functions successfully accomplished. The Library will then be in a position to place its tapes on the open market for the use of other libraries throughout the United States and indeed throughout the world. The Library anticipates entering into a contract with one of the several service bureaus associated with the computer industry. The Library would furnish the bureau with programs, basic tape files, and weekly installments of its indexing on magnetic tape. The service bureau would offer the following for general distribution to libraries, universities, and industry under specified conditions and at predetermined prices. Any library would be in a position, therefore, to acquire the following at approximate cost:

- (1) Computer programs, not only in our own language, ARGUS, but also in languages usable by the most commonly held computers.
- (2) Duplicates of essential file tapes, to make possible expansion of the Compressed Citation File tape and machine printout.
- (3) Duplicates of tape representing additions to the Compressed Citation File; these would be available on a weekly, biweekly, monthly, or less frequent basis.
- (4) Conversion services, to provide initially for the conversion of the two categories of magnetic tape noted above into types acceptable by other computers.

The fundamental assumption on which this distribution plan is built is that medical libraries would have access to research computer centers located in their neighborhoods, and at the cost of machine time could run the MEDLARS tapes for batches of demand searches. This capability is, of course, limited by the variety of computers located in such centers. The

service bureau would offer tape conversion and programs for the computer models most commonly in use. This may be considered an interim step toward the installation of a computer in another library, a circumstance which will be controlled by the volume and costs of the service required. Certainly any library planning a computer installation would be well advised to consider the problem of compatibility with the MEDLARS system.

Under such decentralized conditions, libraries could also benefit in other ways from MEDLARS tapes. For example, the NLM will input its catalog copy for monographs. It anticipates printing out and distributing, in a fashion similar to LC proof sheets, the catalog copy for such books.

How will these developments affect the future of medical libraries? I can give you only a personal opinion, subject to the fallibility of human judgment and the imperfection of human long-range vision. The period of adjustment will, I am sure, be full of stress. More has been asked of medical libraries, and even more will be asked in future than they are capable of performing. On the one hand, administrators and research directors will exert pressures on libraries to enter forthwith the world of machine storage and retrieval of information; on the other, the resources of trained manpower which are necessary to make this possible do not exist. Even more disruptive will be the pressures to undertake the basic research and development of local systems, independent of MEDLARS, such as are frequently proposed without appreciation of the economic realities of indexing operations.

To these pressures will be joined the increased local service loads which will be generated by the recurring bibliographies and the demand searches. Local library resources, already inadequate, will be more so; interlibrary loan and photoduplication services will be strained beyond their capacities. These pressures will result in three trends:

- (1) An effort to develop library resources nationally so that they may meet the increased demands which machine retrieval will evoke. This will require national planning involving reconsideration of regional library centers, and better measures for testing the adequacy of local collections.
- (2) An effort to train manpower so that decentralized search centers can be staffed. The "searcher" type of person who stands as an intermediary between the research scientist and the computer will require skills at a new level of professional competence. These requirements will have a continuing impact on education and training for medical librarianship, and on the educational standards of the profession.
- (3) An effort to introduce machine searching systems, dependent on MEDLARS, into medical libraries, to give them the power of providing local search for local needs.

Decentralized MEDLARS search centers may develop faster than can now be anticipated. The speed, however, will be controlled by the volume of local requirements, the availability of trained manpower, and the presence of book and journal resources to match the power of machine retrieval.

Once the medical libraries have survived this stressful period in their evolution—as I am certain they will—I can confidently predict an upturn in their fortunes. The downward trend of lessening support will have been reversed, for the simple reason that the libraries will be performing a more useful function for which society is willing to pay.

Their most significant asset, collections of publication resources required by medical research, will have been materially augmented. Their ability to provide textual information, either by loan or by photoduplication, will have been improved. To these strengths will have been added a computer-based ability to retrieve and divert this stored information to any conceivable research purpose. And these are two fundamental requirements for the new forms of categorically oriented interdisciplinary research created by the scientific revolution. The medical library, serving as both the central repository and the central switching mechanism, will be in a position to serve areas of research far more effectively, and with recognition of this circumstance will come renewed confidence and support.

You will note that I do not predict automated libraries as a result of the coming of MEDLARS. To my mind, of far greater significance than machinery which can do superbly a job which may not need doing is the revival, restoration and recognition of the library function. Society has found this function valuable in the past, and it will in the future. The ultimate meaning of MEDLARS to the medical library community lies in its potential capacity to revitalize and redirect the library as an institution created and supported by society to provide information services. What lies ahead is not a revolution of automation; it is a renaissance of libraries.